Economic Effects of Optimizing Pharma Therapy

Sessions W101 and W102

May 22, 2002

by

Susan D. Horn Ph.D

Institute for Clinical Outcomes Research
2681 Parleys Way, Suite 201
Salt Lake City, Utah 84109
801-466-5595 (V) 801-466-6685 (F)
shorn@isisicor.com
www.isisicor.com

Summary of Findings

Curtailing access to medications via cost-control mechanisms can adversely affect other healthcare utilization:

- **Additional office visits for dose titration/ monitoring**
- **ER/hospital visits**
- **Concomitant medications**

and increase total healthcare costs.

Intended and Unintended Consequences of HMO Cost-Containment Strategies

Results from the Managed Care Outcomes Project

American Journal of Managed Care
March 1996

Main Study Question

"When one looks across multiple managed care organizations at a year's worth of actual data on the care of thousands of typical patients treated by their regular doctors, how is the amount of health care services used associated with cost-containment efforts by the HMO?"

CPI Study Design

Process to Develop Decidable and Executable Dynamic Protocols

Improve/Standardize

Process Factors

- Management Strategies
- Interventions
- Medications

Control for:

Patient Factors

- Disease
- Severity of Disease
  - physiologic signs and symptoms
  - complexity/psychosocial factors
- Multiple Points in Time

Measure:

Outcomes

- Clinical
- Health Status
- Cost/LOS/Encounte

Managed Care Outcomes Project

HMO Sites

- One each in the Northeast, central East, Southeast, central West;
- Two in the Southwest

- Each site had various leve of limitations on reimburs prescription drugs and ot cost-containment practic

- Half were not-for-profit
- Half were for-profit

- All were either group- or staff-model plans

Managed Care Outcomes Project

Disease groups studied:

- Ear Infection
- Arthritis
- Hypertension
- Asthma
- Ulcers

Managed Care Outcomes Project

Patient Population:

Nearly 13,000 patients were included in the study:

- **1,309 - 3,938 patients for each disease group**

This represented more than:

- **99,000 office visits**
- **480 emergency room visits**
- **1,000 hospitalizations**
- **240,000 prescriptions**

Length of study period:

- **One year**

Managed Care Outcomes Project

- ***Unlike previous studies, this study***
- **Collected data on individual patients**
- **Examined healthcare use for period up to one year**
  - **office visits**
  - **prescription drug use**
  - **emergency room visits**
  - **hospitalizations**
- **Measured severity of illness at each encounter, analyzed data by severity categories**
- **Considered the effect of cost-containment strategies on patient use of healthcare services**

Managed Care Outcomes Project

Study controlled for patient, cost-containment practice, and HMO site variables

Patient variables

- Severity of patient illness
- Age and gender
- Time in study
- Number of physicians seen by patient

Cost-Containment Practice Variables

- Second-opinion requirements
- Strictness of site's gatekeeper
- Strictness of case mgt.
- Drug and visit co-pays
- Restrictions of formulary
- Extent of generic drug use

HMO Site Variables

- Physician payment method
- HMO profit status
- Geographical location

Managed Care Outcomes Project

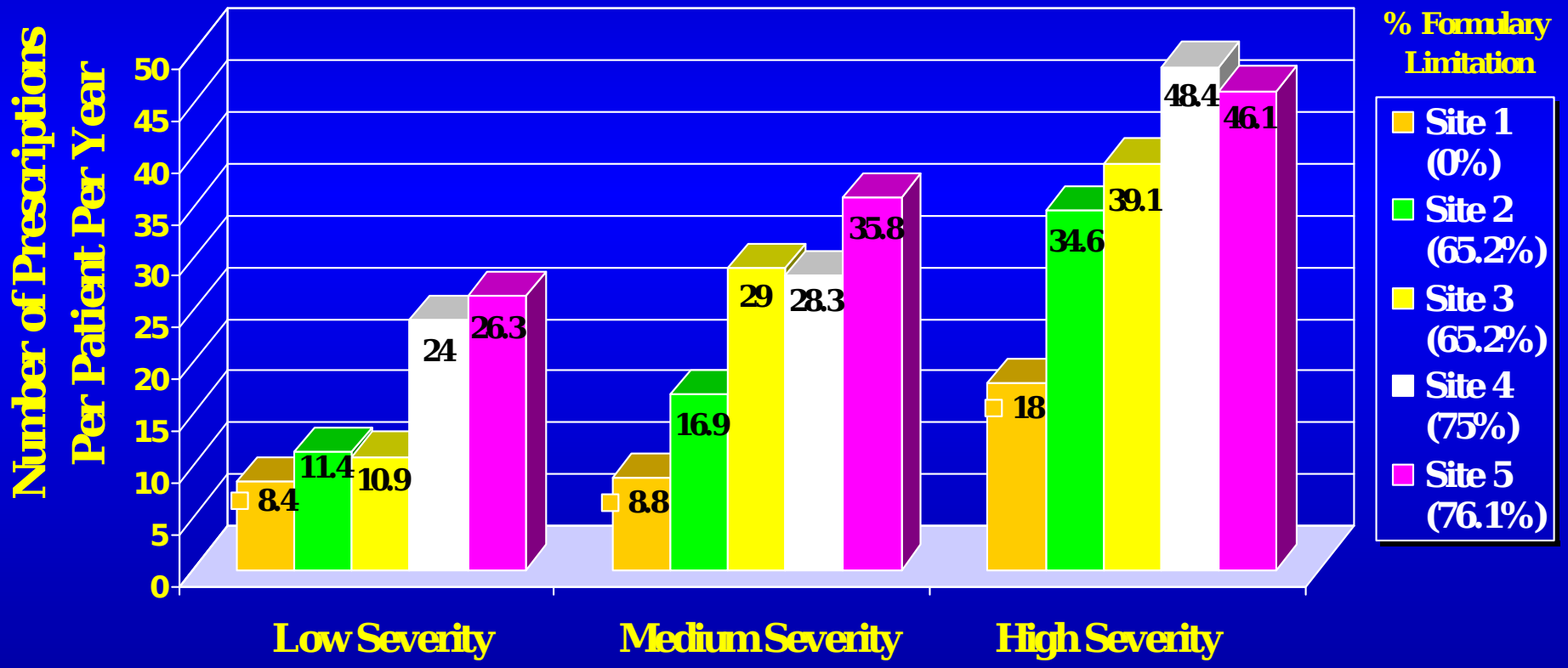
Findings

With increased formulary restrictiveness, the study found:

- **More patient visits to physicians**
- **More emergency room visits**
- **More hospitalizations**
- **Greater estimated cost of prescriptions per yea**
- **Greater number of prescriptions per year**

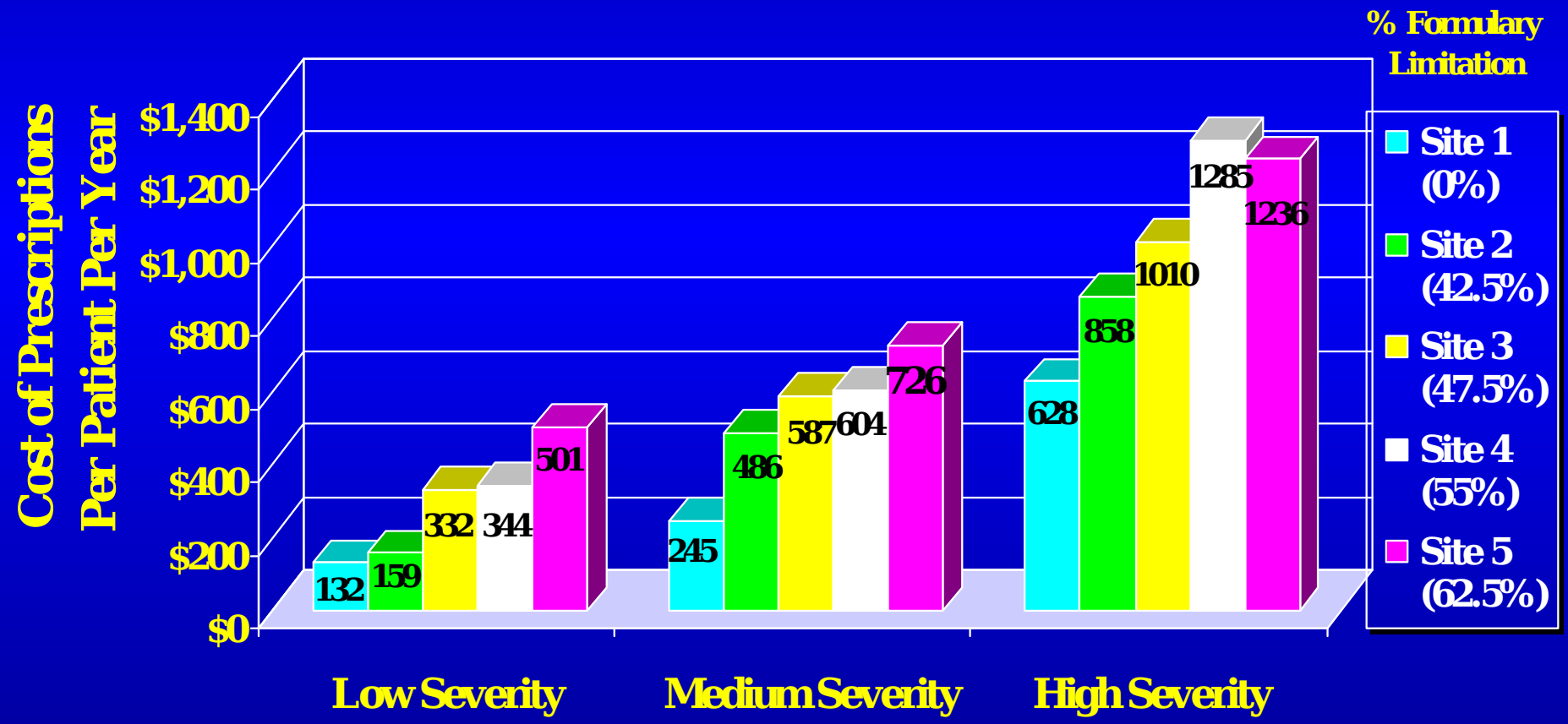
Managed Care Outcomes Project

Number of Prescriptions for Asthma



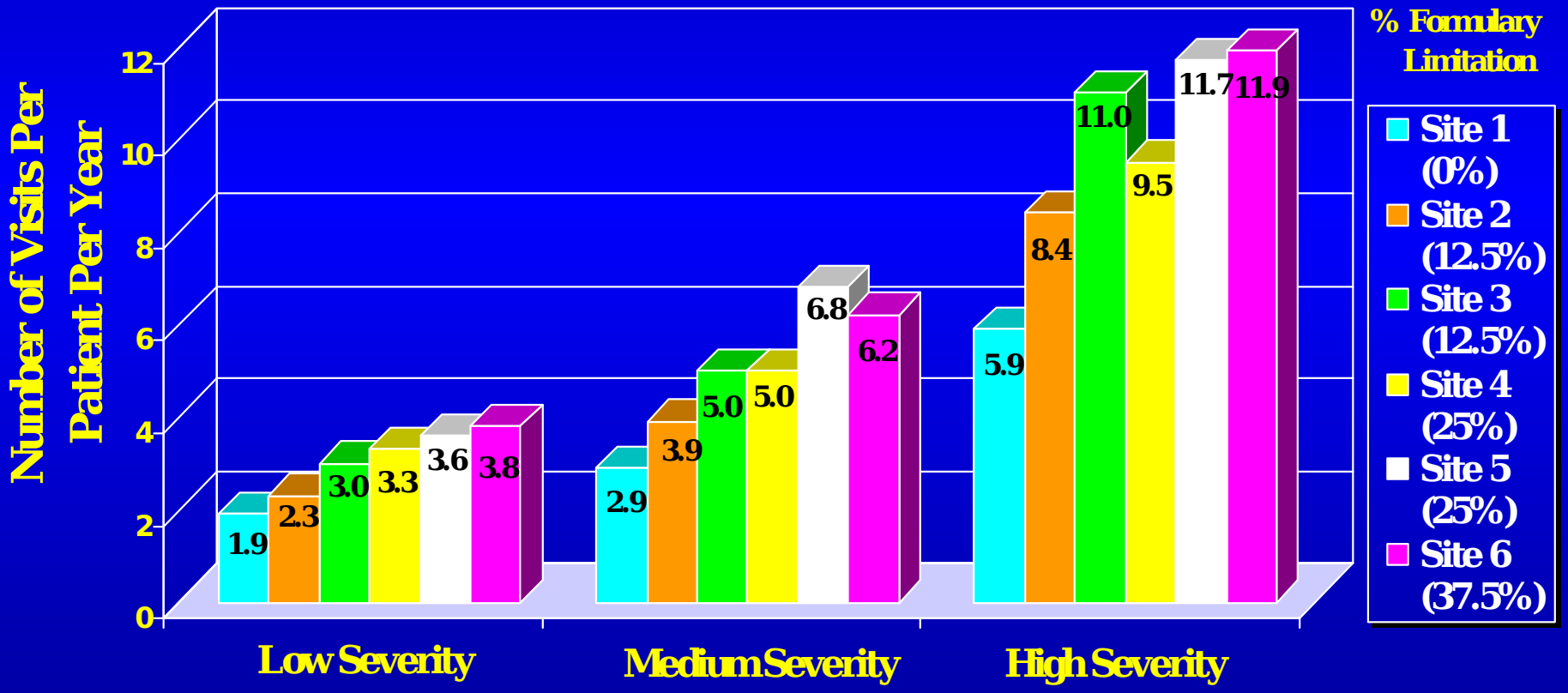
Managed Care Outcomes Project

Cost of Prescriptions for Arthritis



Managed Care Outcomes Project

Number of Visits for Ulcers



Why Might Elderly Be At Greater Risk with Formulary Limitations?

- **Physiologic differences in elderly may affect**

-absorption -distribution -metabolism -elimination

- **Elderly often take multiple medications and are at greater risk for adverse drug reactions and significant drug-drug interactions.**

Specific Drug Class Limitations By Age Category

Hypertension

Description	0-64 Years		65+ Years	
	Drug Cost (Total)	Drug Cost (Study Disease)	Drug Cost (Total)	Drug Cost (Study Disease)
Loop Diuretics	.002 (.69)	.0001 (.98)	.023 (.0001)	.0186 (.0001)
Severity Sum	.003 (.009)	.007 (.0001)	.005 (.0007)	.0010 (.0001)
Sample Size	2,187		969	

Regression Coefficients for Specific Drug Class Limitations By Age Category

Ulcers

Description	0-64 Years		65+ Years	
	Drug Cost (Total)	Drug Cost (Study Disease)	Drug Cost (Total)	Drug Cost (Study Disease)
H_2Antagonists	.052 (.0001)	.079 (.0001)	.033 (.0012)	-.035 (.25)
Severity Sum	.0066 (.0008)	.0080 (.0002)	.0060 (.0003)	.0045 (.1426)
Sample Size	1,067		261	

Conclusions for Elderly

"...greater formulary restrictions are associated with higher resource utilization by elderly patients."

"...there are differences between elderly and non-elderly patients in utilization of drugs, outpatient visits, and hospitalizations."

"...findings have implications for health policy and the design of prescription benefit programs for the elderly."

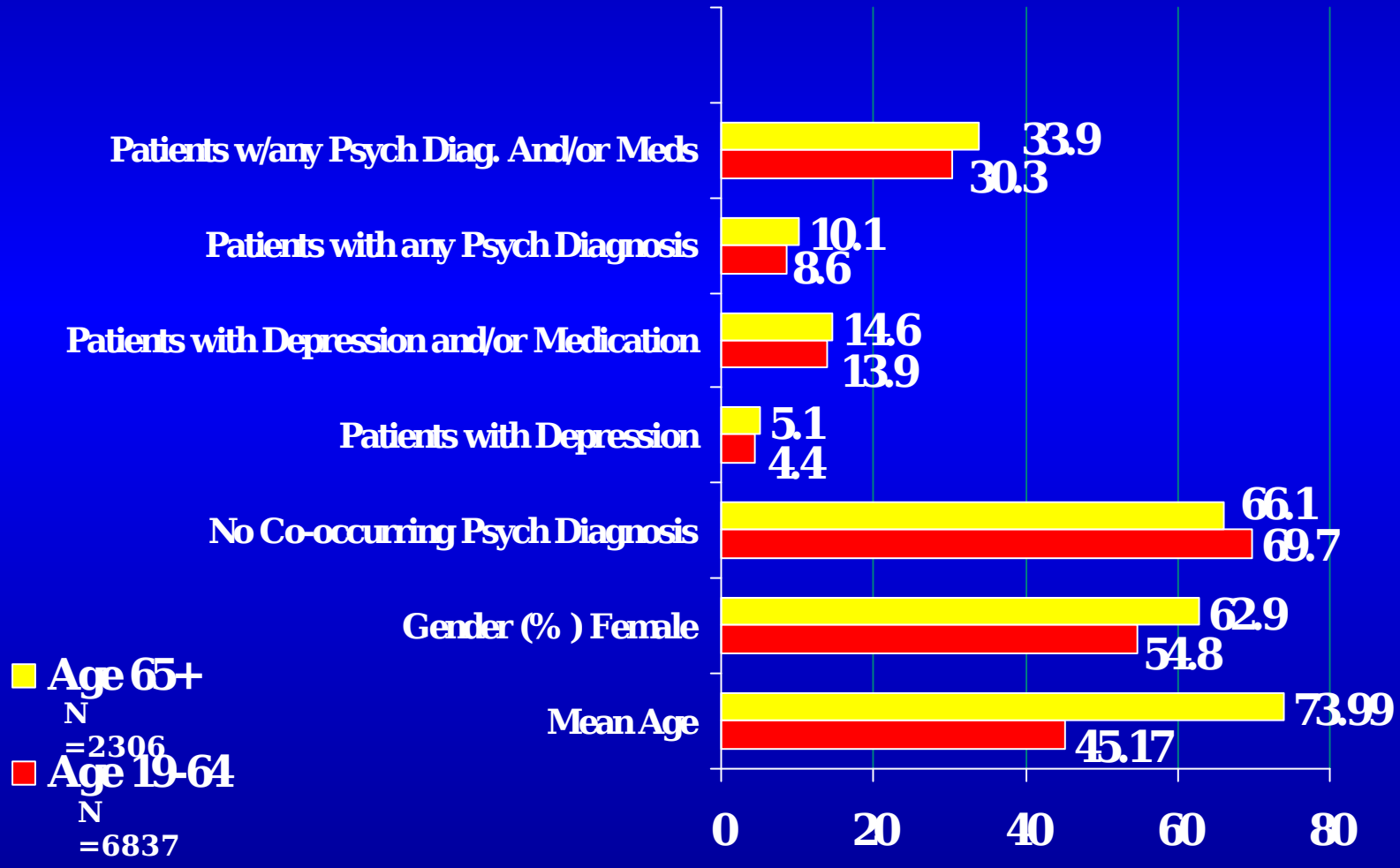
Horn SD, et al. American Journal of Managed Care 1998;4:8:1105-1113

Increases Total Health Care Costs

Conclusions

"...limiting mental health services [visits to mental health providers and psychiatric drugs] was associated with higher total health care costs."

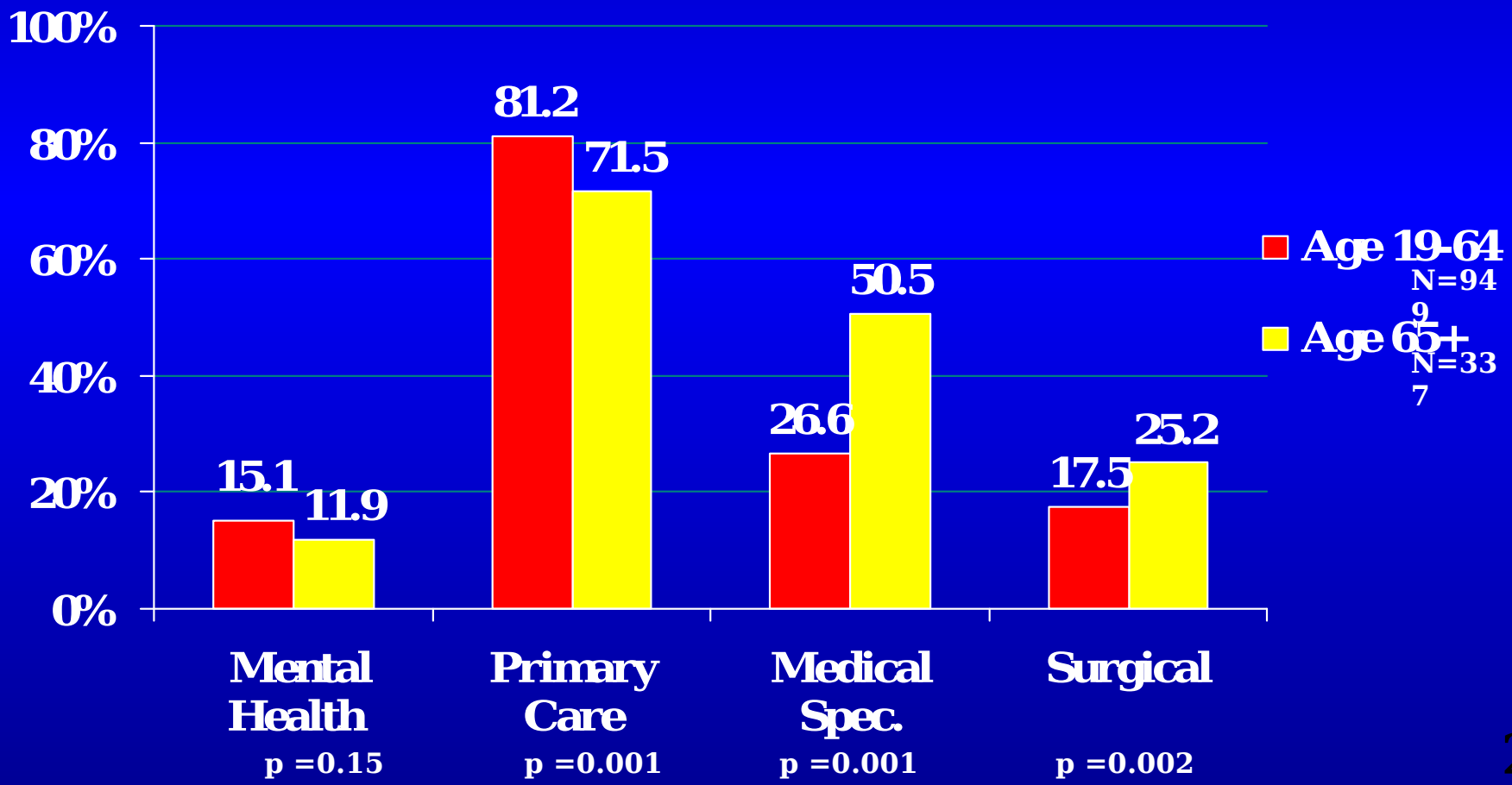
DESCRIPTION OF PATIENT POPULATION



SPECIALTY PROVIDER USE OVER ONE YEAR

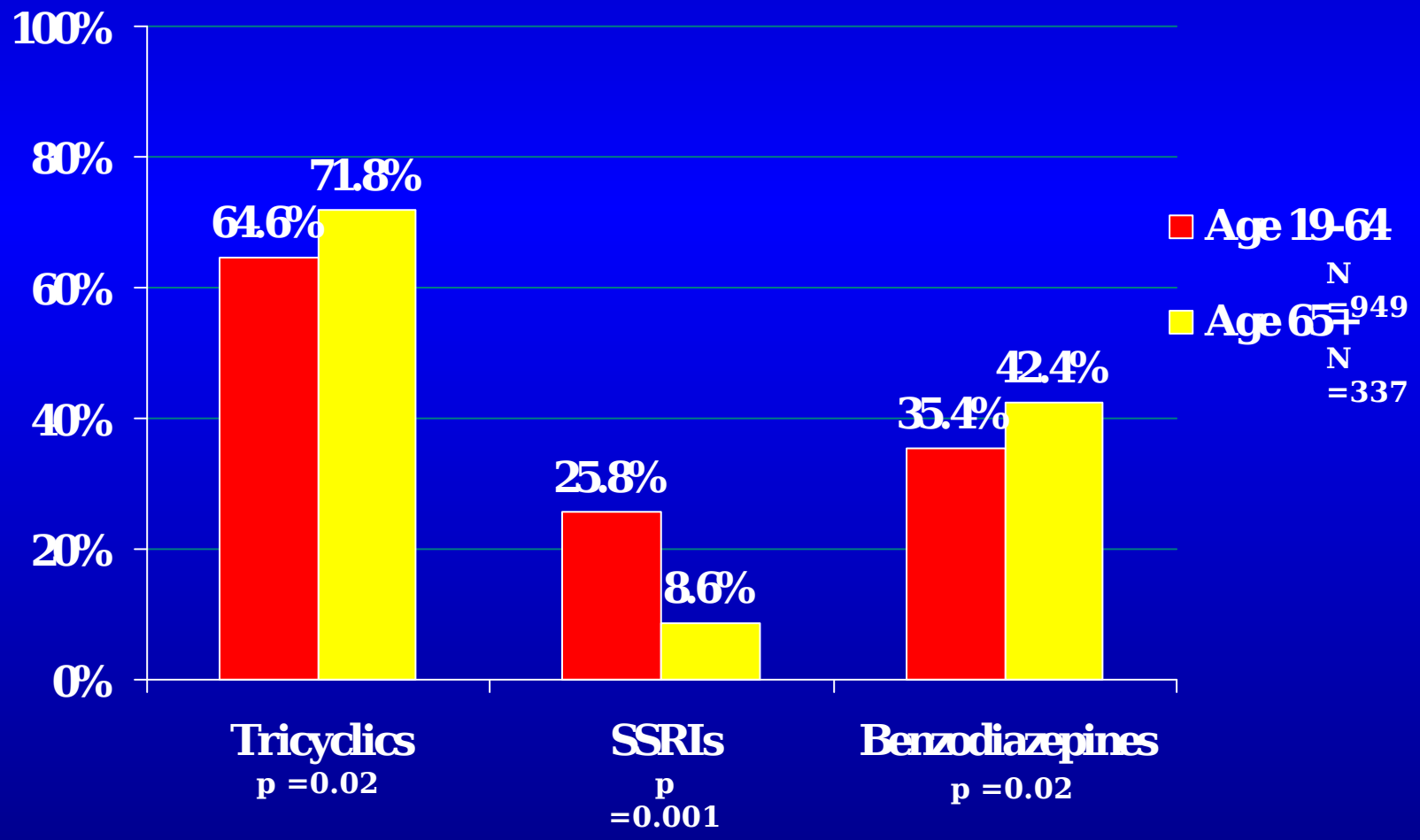
Proportion of Patients Seeing Provider

Depression and/or Antidepressant Medications

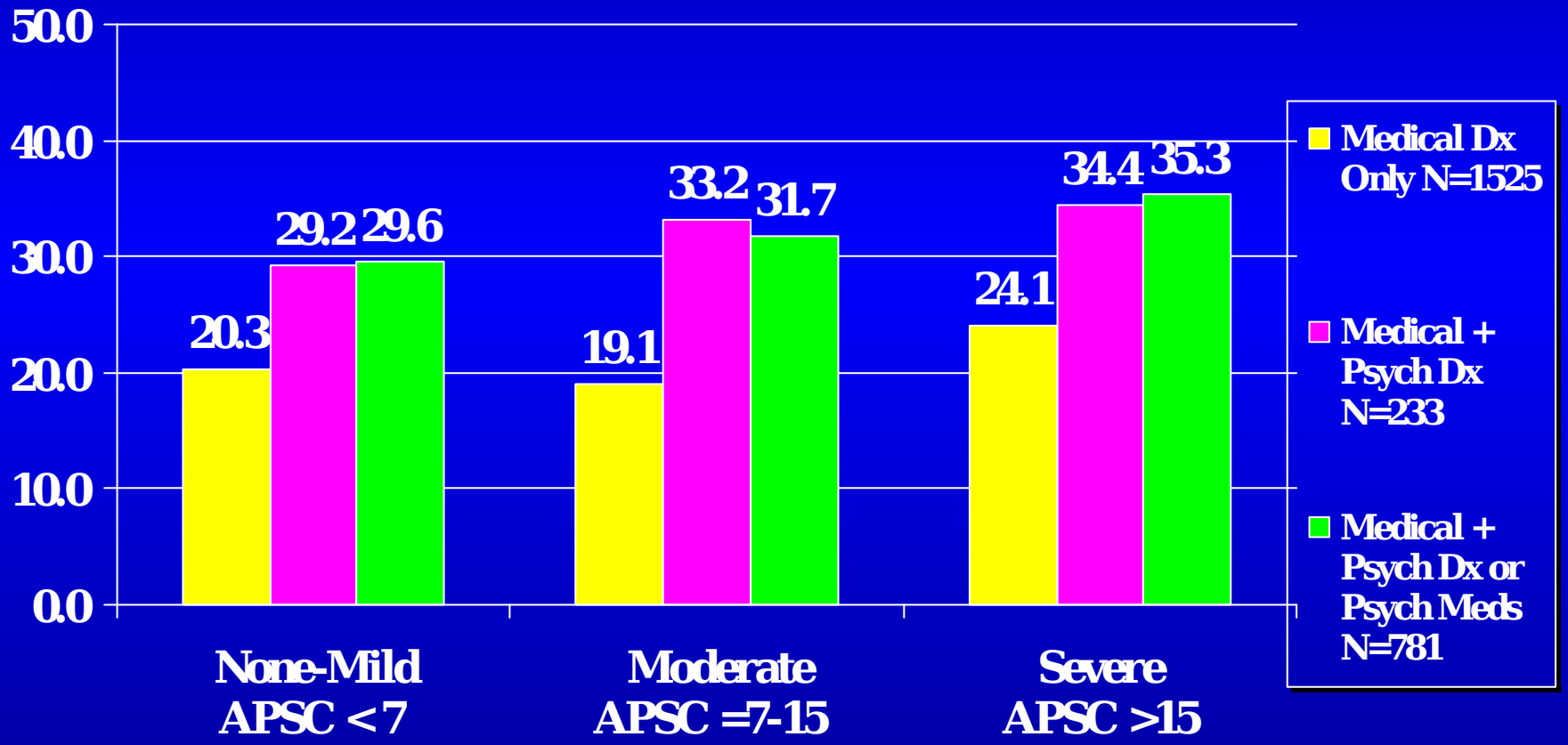


Proportion Receiving Psychiatric Medications

Depression and/or Antidepressant Medications

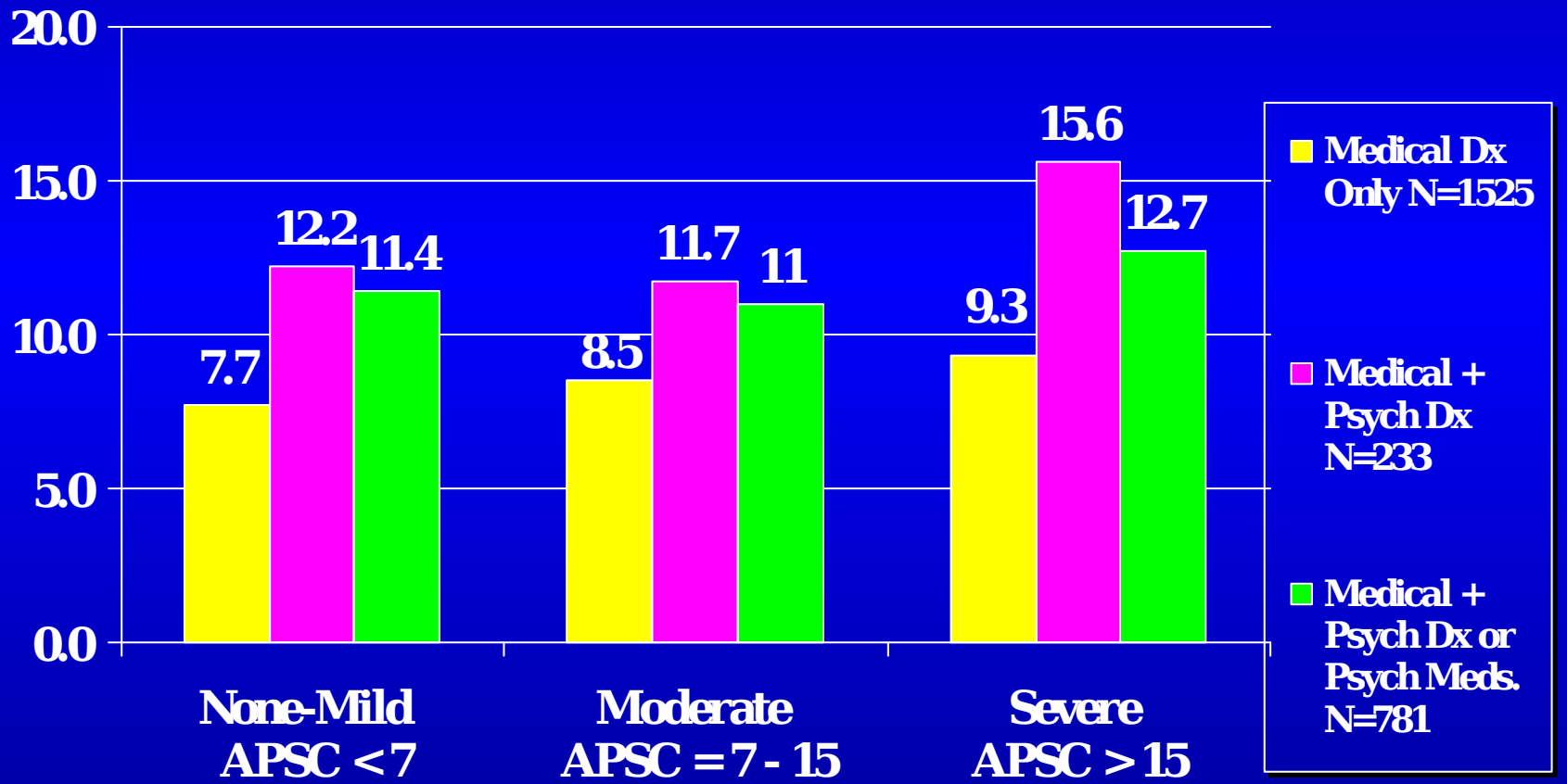


Number of Medication Prescriptions Per Year *Removing Psychiatric Medications*



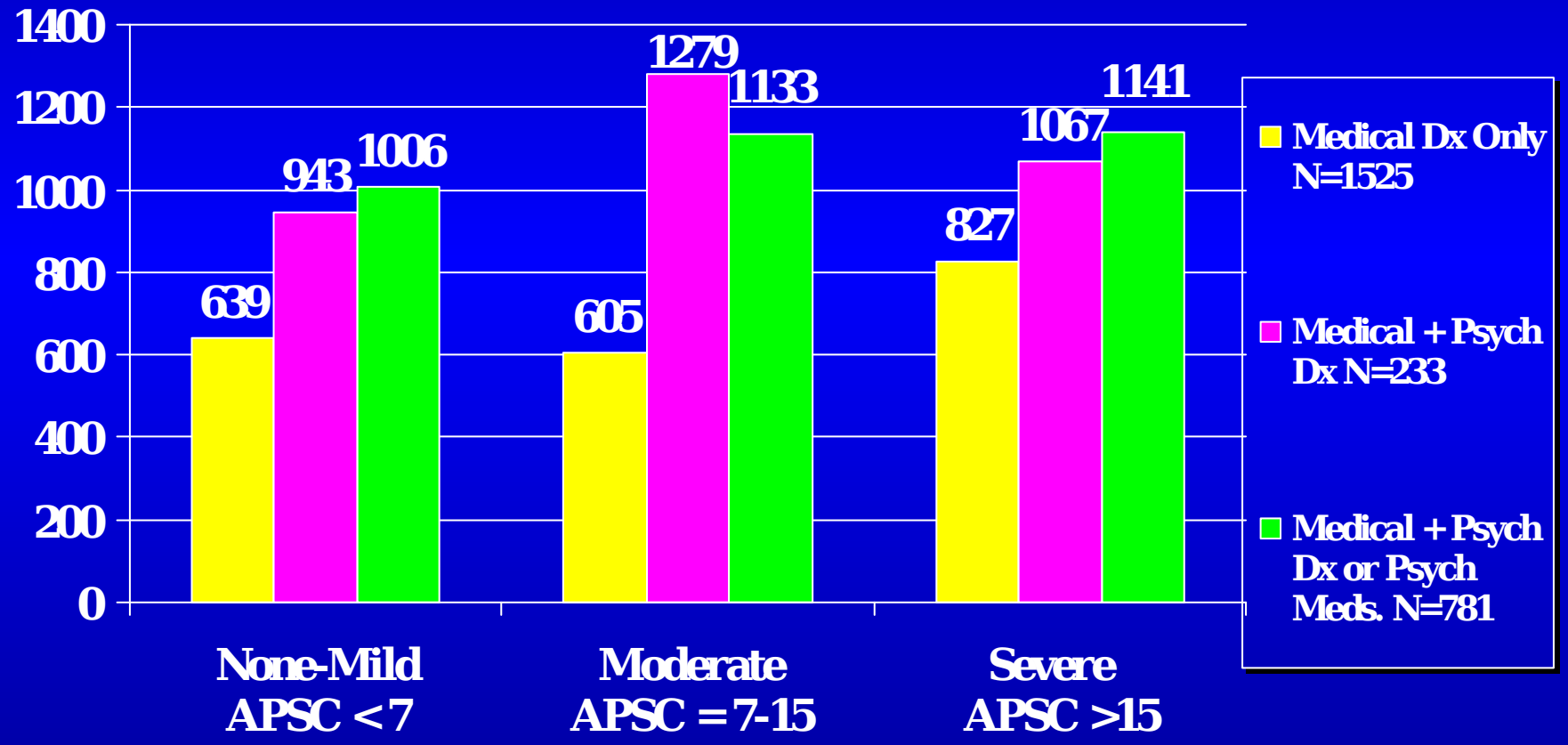
Number of Outpatient Visits Per Year

Removing Psychiatric Visits



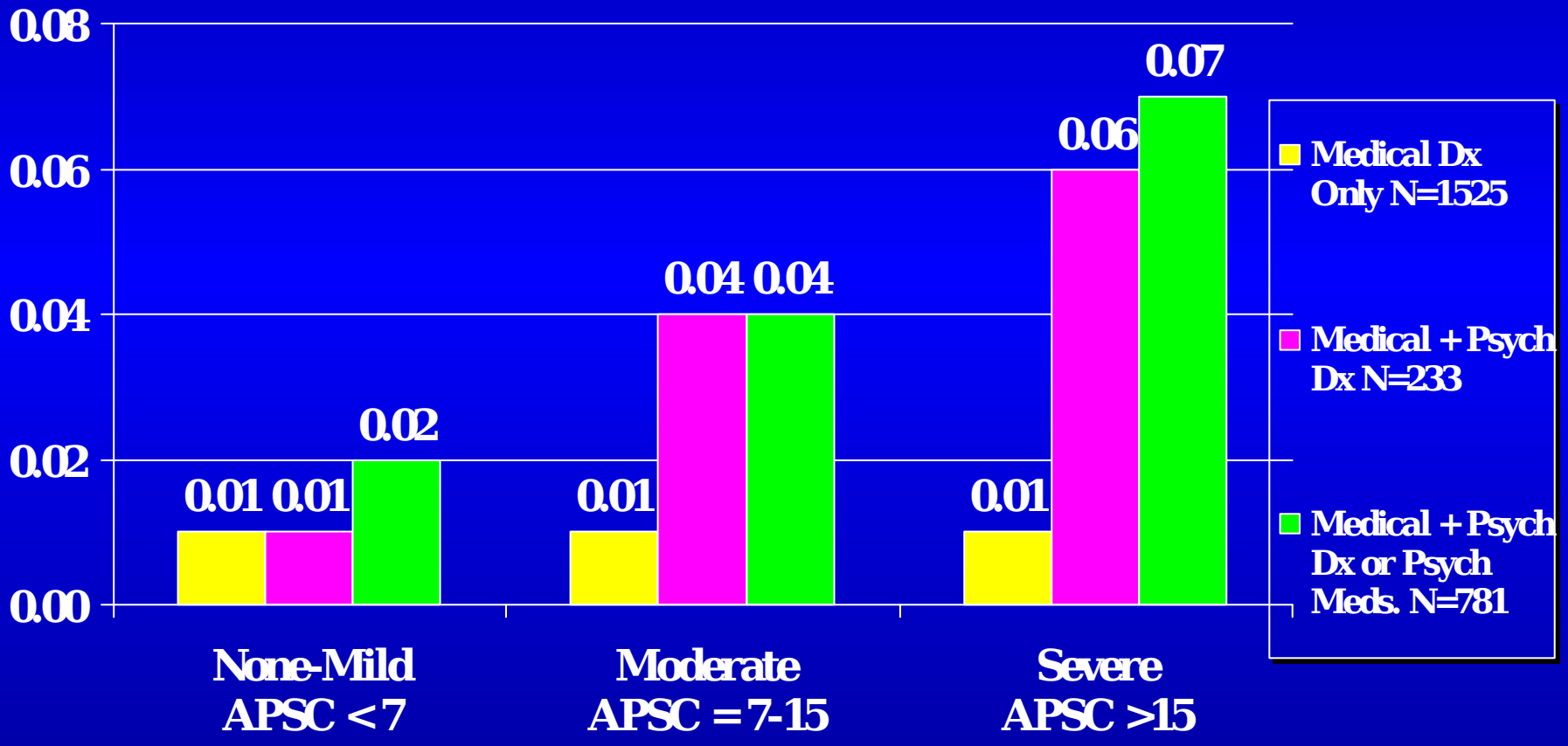
Medical Severity

Total Cost of Medication Prescriptions Per Year



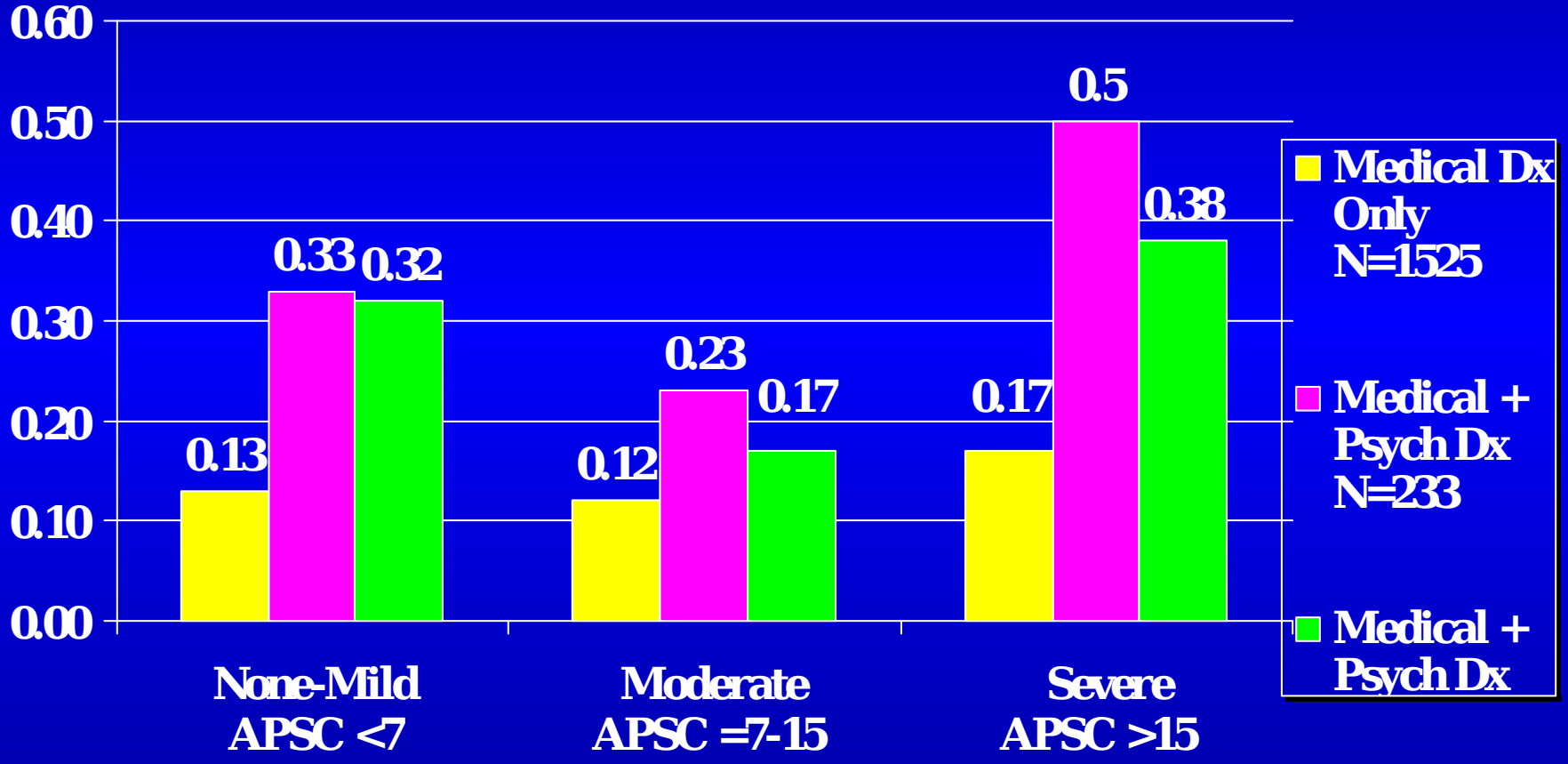
Medical Severity

Emergency Room Visits Per Year



Medical Severity

Number of Hospitalizations Per Year



Bartels SJ, et al. International Journal of Psychiatry in Medicine 1997;27:3:215-231

Managed Care Outcomes Project

Findings

- **Strong relationship between formulary restri increased resource use for all five study dise all levels of illness severity.**
- **Sites most severely restricting formularies o double the use of healthcare services vs. site formulary restrictions.**
- **Site with no formulary almost always had low healthcare.**

Managed Care Outcomes Project

Findings suggest the need for a systems or disease/case management approach to the use of cost-containment tools

- **Should be viewed as an interrelated syste**
- **Should comprehensively evaluate the imp cost-containment practices on all compon and overall quality of care.**

Lovelace Health System Confirmed our Findings

- **Used Zung self-reporting questionnaire to screen for depression in “heavy utilizers” of medical services.**
- **Found 37% with depression among heavy utilizers.**
- **Lovelace made SSRIs the drug of choice for depression.**

Lovelace Health System Findings

- **"That's an expensive decision, but . . . the first treatment of depression [should] be as successful as possible, and we thought the choice of an SSRI would increase that success rate."**
- **"2,079 patients' combined 12-month medical costs before diagnosis of depression were $13.2 million, compared to $11.1 million after diagnosis" [and treatment].**

Mitchell J, et al. American Journal of Managed Care 1997;3(2):323-330

Limiting SSRIs – Potential Pitfalls

- **No single SSRI works for all patients, all forms of depression, all situations, or is superior in efficacy over all others within or between classes.**
- **If limit to one SSRI, 25% of patients will not respond to that agent and need to switch, resulting in referral to more costly psychiatry specialty sector or patient drop out.**

Limiting SSRIs – Potential Pitfalls

- **Patients who switch SSRIs are in treatment 50% longer and cost approximately 50% more to treat in more costly treatment settings.**
- **Having several antidepressant agents allows more options to continue treating patient.**
- **Antidepressant pharmaceuticals represent <10% of total direct costs of depression**

Hensley and Nurnberg, *Pharmacoeconomics* 2001; 19(10): 973-982

Limits Healthcare Costs by Expanding Benefits

Wall Street Journal 5/23/2000

Merrill Lynch Example
Benefits

- No limits on mental health hospitalizations and rehab services if doctor says medically necessary and progress is made
- Retool coverage to accommodate special needs
- Generic substitution not required

Merrill Lynch Example

Results

- **Adjusted for inflation, health care costs have declined, while benefits have expanded**
- **Merrill Lynch spends about 25% less per employee than similarly sized companies**

Study

- ***Patients:*** **22,848 HMO Medicare enrollees ≥ 65 yrs.**
- ***Time:*** **Enrolled throughout Jan. to Dec. 1994.**
- ***Setting:*** **Three multispecialty physician medical groups (PMG's).**
- ***Outcomes:*** **Pharmacy expenditures and total health care costs (visits, hospitalizations, medications).**

Pharmaceutical Capitation Study

Results

Controlling for age, gender, and severity of illness, patients with pharmaceutical capitation (and formularies) had:

- **14% higher total health care costs (additional $376 per patient per year).**
- **29% higher pharmaceutical costs (additional $110 per patient per year).**

Pharmaceutical Capitation Study*

Conclusions

"...curtailing access to medications via cost-control mechanisms can adversely affect other health costs and increase total health care utilization."

"Individual capitation of health care components may not be the best approach to controlling costs and assuring quality of care."

**** Popovian, et al. Journal of Managed Care Pharmacy, 5:5 (Sept/Oct 1999)***

Mental Health Effects

- During 3 prescription per month limit on New Hampshire Medicaid patients
  - 15 - 49% reductions in use of psychotropic agents
  - Increase 1 - 2 visits per patient per month to community mental health centers
  - Increased emergency mental health services and partial hospitalizations by 1.2 - 1.4 episodes per patient per month
  - No change in frequency of hospital admissions
- Increase in Medicaid mental health care costs exceeded drug cost savings by factor of 17
- After limit was discontinued, use of medications and most mental health services reverted to baseline levels

NEJM 1994 v.331

Hospital & Nursing Home Effects

- During 3 prescription per month limit on New Hampshire Medicaid patients
  - 35% decline in use of study drugs
  - Increase in nursing home admissions
  - No significantly increased risk of hospitalization
- Patients admitted to nursing homes generally did not return to community
- After limit was discontinued, use of medications reverted nearly to baseline levels and excess risk of admission to nursing homes ceased.

NEJM 1994 v.331

Chlamydia Trachomatis Study

- **Doxycycline**
  - **100 mg orally twice daily for 7 days**
    - ***estimated cost $5.51***
- **Azithromycin**
  - **1 g orally, single dose**
    - ***estimated cost $18.75***

Study
Per 100,000 patients

Azithromycin Strategy	*Doxycycline Strategy*
Persistent infections	**4,000**	**14,300**
Major outcomes		
Chlamydia sequelae	**928**	**3,200**
Drug Reactions	**10**	**10**
Minor outcomes		
Chlamydia sequelae	**2,053**	**7,339**
Drug reactions	**13,662**	**18,367**
Average cost per patient	**$39.51**	**$69.07**

Management Costs More

***Conclusions*:**

". . . Azithromycin strategy was more cost-effective than doxycycline strategy for women with uncomplicated cervical chlamydial infections."

". . . Adoption of azithromycin strategy may be limited by practical financial constraints of a . . .fragmented health care system in which costs and benefits of preventing chlamydia sequelae are often incurred by different components of the system."

***Reference: Magid D. et al. *Annals of Internal Medicine*, February 15, 1996.**

Summary of Findings

Curtailing access to medications via cost-control mechanisms can adversely affect other healthcare utilization:

- Additional office visits for dose titration/ monitoring
- ER/hospital visits
- Concomitant medications

and increase total healthcare costs.

Better Outcomes and Pharmaceutical Innovation

Using newer drugs has a statistically significant effect on:

- **Reducing number of days lost from work.**
- **Lowering mortality rates.**
- **Decreasing hospital stays.**
- **Decreasing use of inpatient services.**

Lichtenberg F. Are the Benefits of Newer Drugs Worth Their Cost? Evidence From the 1996 MEPS. Health Affairs, 2001; 20(5):241-251.

Better Outcomes and Pharmaceutical Innovation

New technologies and innovations in pharmaceuticals

are associated with:

- **Fewer side effects.**
- **Improved drug safety and effectiveness.**
- **Greater ease of use, increasing compliance**
- **Treatments better tailored to individual patient needs.**

Wertheimer A, Levy R, O'Conner T. Too Many Drugs? The Clinical and Economic Value of Incremental Innovations. Research in Human Capital and Development: Investing in Health: The Social and Economic Benefits of Health Care Innovation, 2001;14:77-118.

Better Outcomes and Pharmaceutical Innovation

- **Hospital days declined most rapidly for diagnoses with greatest increase in number of drugs prescribed and greatest use of new drugs.**
- **30 percent decline in mortality associated with heart attacks. Pharmaceuticals alone were responsible for over one-quarter of overall reduction in mortality – by far the single most important factor explaining the decline.**

Meyer JA. Assessing Impact of Pharmaceutical Innovation: A Comprehensive Framework. February 2002. New Directions for Policy, Washington D.C.

Better Outcomes and Pharmaceutical Innovation

- There is substantial reduction in the proportion of elderly in institutional care:
  - 6.8 percent in 1982
  - 6.1 percent in 1989
  - 4.2 percent in 1999
- Rate of decrease in institutional care from 1994 to 1999 was considerably faster than the rate needed to preserve Medicare solvency through 2070.

Manton K, Gu X. Change in the Prevalence of Chronic Disability in the United States Black and Non-Black Population Above Age 65, 1982-1999. Proceedings of the National Academy of Sciences,

Better Outcomes and Pharmaceutical Innovation

The cost of treating major depression in the U.S. fell by 25 percent from 1991 to 1995 because of advances in antidepressant drugs.

National Bureau of Economic Research. Measuring the Prices of Medical Treatments. Washington, D.C. December 1997.

Newer Drugs for Asthma Lower Health Care Costs

10% increase in use of newer drugs was associated with a YEARLY DECREASE of:

- **$72.31 in drug costs for newest drugs**
- **$50.52 in drug costs for second newest**
- **0.12 fewer GP visits for newest drugs**
- **0.08 fewer GP visits for second newest**
- **Fewer ED visits**
- **Fewer hospitalizations**

Horn SD, et al. Annals of Pharmacotherapy 2001;35:990-6

Enhanced Productivity and Pharmaceutical Innovation

Enhancing Productivity

Pharmaceutical innovation also may have a direct impact on the economy through reduced absenteeism and enhanced productivity.

Meyer JA. Assessing Impact of Pharmaceutical Innovation: A Comprehensive Framework. February 2002. New Directions for Policy, Washington D.C.

Enhanced Productivity and Pharmaceutical Innovation

Newer drugs are associated with:

- **More active and productive employees.**
- **Reduced absenteeism from work.**
- **Greater labor productivity.**
- **Lower employee turnover.**

Lichtenberg F. Are the Benefits of Newer Drugs Worth Their Cost? Evidence From the 1996 MEPS. Health Affairs, 2001; 20(5):241-251.

Enhanced Productivity and Pharmaceutical Innovation

Drugs contribute to greater productivity, primarily by reducing lost school and work days:

Medical costs declined by $822 per employee per year and absenteeism dropped by nine days when depressed workers were treated with a range of anti-depressant medicines. Savings from improved productivity and the reduction in work loss and medical costs far outweighed the cost of drug treatment.

Rizzo J, et al. Labor Productivity Effects of Prescribed Medicines for Chronically Ill Workers. Health Economics 1996;5(3):249-265.

Over-Use of Pharmaceutical Innovation

New drugs are sometimes over-utilized and therefore

drive up health care costs…

While these technologies may reduce costs if their use is restricted to an appropriate population, they can actually drive up overall costs if they are employed in the care of those patients outside the population for whom they have been shown to be medically appropriate and cost-effective

Mohr P, et al. The Impact of Medical Technology on the Future of Health Care Costs. February 28, 2001. Project Hope, Bethesda, Maryland.

Guidelines for Best Use of Pharmaceutical Innovation

Rising drug costs are, in general, part of the solution, not part of the problem. They can only be part of the solution to control spending, if reimbursement mechanisms are based on sound clinical research and prescriptions are targeted specifically to those patients who would reap health benefits greater than the increased cost of the drug.

Kleinke, J. The Price of Progress: Prescription Drugs in the Health care Market. Health Affairs, 2001;
20(5):43-60.

(NPULS) 1996-1997

- 6 long-term care providers; 111 facilities
- n = 2,490 residents
- 1343 with pressure ulcer; 1147 at risk
- 2644 ulcers (new and existing)
- 70% female, 30% male
- Average age = 79.8 years

Long Term Care CPI Results

Develop Pressure Ulcer

General Care

General Assessment

+ Age ≥ 85
+ Male
+ Severity of Illness
+ History of PU
+ Dependency in >= 7 ADLs
+ Diabetes
+ History of tobacco use

Incontinence Interventions

+ Mechanical devices for the containment of urine (catheters) (treatment time >= 14 days)
- Disposable briefs (treatment time >= 14 days)
- Toileting Program

Pressure Relief Interventions

+Static pressure reduction: protective device (treatment time >= 14 days)
+Positioning: protective device (treatment time >= 14 days) (p=.07)

Staffing Interventions

- RN hours per patient day >= .25
- CNA hours per patient day >= 2

Medications

- Antidepressant

Long Term Care CPI Results

Develop Pressure Ulcer

Nutritional Care

Nutritional Assessment	Nutritional Interventions
+ Dehydration signs and symptoms: low systolic blood pressure, high temperature, dysphagia, high BUN, diarrhea, dehydration	- Fluid Order
+ Weight Loss: >=5% in last 30	- Nutritional Supplements • standard medical • snacks
	- Enteral Supplements • disease-specific • high calorie/high protein

Effects of Nutritional Support in Long Term Care

Nutritional Treatment Strategies	N	Pressure Ulcer Develop Rate
Enteral Formula Only	189	26.0%
Oral Supplement / Standard Medical Only	91	28.6%
Combinations	796	31.4%
No Nutritional Risk -- No Nutritional Treatment	183	31.7%
At Nutritional Risk -- No Nutritional Support	460	41.5%

Bladder Incontinence Management in LTC

Treatments	N	PU Develop Rate
Incontinent -- Use of one or more of the following treatments:	1,441	34.2%
- Toileting Program	519	27.4%
- Briefs, disposable	527	26.9%
- Bed pads, disposable	212	30.7%
- Topical Treatment	1,148	34%
- Briefs, reusable	115	34.8%
- Bed pads, reusable	223	38.1%
- Use of mechanical device (catheter)	230	53.5%
Continent -- No incontinence treatment	93	20.4%

Long-Term Care Residents with Agitation in Dementia
Recommended Practice Guideline

- **Use fewest number of medications possible (OBRA 1988)**
- **Minimize use of benzodiazepines**
- **Use atypical over typical antipsychotics**
- **Use SSRIs over tertiary amine antidepressants**
- **Avoid combination therapy**

Medications from NPULS Study

Optimal Medications Dementia & Agitation n = 803

No Psych Meds	32.5%
Antipsychotics	31.5%
Antidepressants	34.6%
Anti-anxiety	34.9%

Medication Use and Outcomes for Elderly with Dementia with Agitation

Medication	% Hospital + ER	% Urinary Incontinence	% Pressure Ulcers
Monotherapy[b]	20.8	66.1	37.2
Combination Therapy[c]	14.3*	52.9**	23.5**
SSRI +	11.6**	47.4**	16.8**

[b]=Monotherapy includes Antipsychotic only or antidepressant
[c]=Combination Therapy includes Antipsychotic plus or Antide
with crossover individuals being removed.
*p≤.05 **p≤.01

Antibiotic Guideline Study

	1988	1994
Percentage of patients receiving antibiotics	31.8%	53.1%
Percentage receiving broad spectrum antibiotics	24%	47%
Medicare case mix index	1.75	2.05
Total antibiotic acquisition costs (adjusted for inflation)	$987,547	$612,500
Percentage of pharmacy budget	24.8%	12.9%

Antibiotic Guideline Study

	1988	1994
Antibiotic cost per treated patient (adjusted for inflation)	$122.66	$51.90
Appropriate pre-op antibiotic use	40%	99.1%
Average number of doses of prophylactic antibiotic	19	5.3
Antibiotic associated ADE (adverse drug events)		↓ 30%
Mortality	3.65%	2.65%

Pestotnik SL, et al. Annals of Internal Medicine 1996;124:884-890

Comprehensive Approaches to Care Save 30% to 50% of Health Costs

Improve/Standardize

Process Factors

- **Management Strategies**
- **Interventions**
- **Medications**

Control for:

Patient Factors

- **Disease**
- **Severity of Disease**
  - **physiologic signs and symptoms**
  - **complexity/psychosocial factors**
- **Multiple Points in Time**

Measure:

Outcomes

- **Clinical**
- **Health Status**
- **Cost/LOS/Encounte**

Summary of Findings

Curtailing access to medications via cost-control mechanisms can adversely affect other healthcare utilization:

- **Additional office visits for dose titration/ monitoring**
- **ER/hospital visits**
- **Concomitant medications**

and increase total healthcare costs.

Related Articles

- Horn SD. Using Clinical Practice Improvement: An Interview with Susan Horn. The Joint Commission Journal on Quality Improvement 21:6 (June 1995) 301-308.
- Horn SD, Sharkey PD, Levy R. A Managed Care Pharmacoeconomic Research Model Based on the Managed Care Outcomes Project. Journal of Pharmacy Practice 8:4 (August 1995) 172-177.
- Horn SD. The Clinical Practice Improvement (CPI) Model and How It Is Used to Examine the Availability of Pharmaceuticals and Utilization of Ambulatory Healthcare Services in HMOs: Results from the Managed Care Outcomes Project (MCOP). PharmacoEconomics 10: (Supplement 2, 1996) 50-55.
- Magid D, Douglas JM, Schwartz JS. Doxycycline Compared with Azithromycin for Treating Women with Genital Chlamydia Trachomatis Infections: An Incremental Cost-Effective Analysis. Annals of Internal Medicine 124:4 (February 15, 1996) 389-399.
- Horn SD, Sharkey PD, Tracy DM, Horn CE, James B, Goodwin F. Intended and Unintended Consequences of HMO Cost-Containment Strategies: Results from the Managed Care Outcomes Project. The American Journal of Managed Care 2:3 (March 1996) 253-264.
- Horn SD, Sharkey PD, Gassaway J. Managed Care Outcomes Project: Study Design, Baseline Patient Characteristics, and Outcome Measures. The American Journal of Managed Care 2:3 (March 1996) 237-247.
- Pestotnik SL, Classen DC, Evans S, Burke JP. Implementing Antibiotic Practice Guidelines through Computer-Assisted Decision Support: Clinical and Financial Outcomes. Annals of Internal Medicine 124:10 (May 15, 1996) 884-890.
- Horn SD. Tools and Techniques in Disease Management: Programmes for Improving and Measuring Outcomes. Disease Management and Health Outcomes 1:1 (January 1997) 17-25.
- Bartels SJ, Horn SD, Sharkey PD, Levine K. Treatment of Depression in Older Primary Care Patients in Health Maintenance Organizations. International Journal of Psychiatry in Medicine 27:3 (March 1997) 215-231.

Related Articles

- Horn SD, Sharkey PD, Phillips-Harris C. Formulary Limitations in the Elderly: Results from the Managed Care Outcomes Project. The American Journal of Managed Care 4:8 (August 1998) 1105-1113.
- Raddish M, Horn SD, Sharkey PD. Continuity of Care: Is It Cost Effective? The American Journal of Managed Care 5:6 (June 1999) 727-734.
- Clemmer TP, Spuhler VJ, Oniki TA, Horn SD. Results of a Collaborative Quality Improvement Program on Outcomes and Costs in a Tertiary Critical Care Unit. Critical Care Medicine 27:9 (September 1999) 1768-1774.
- Willson DF, Horn SD, Smout RJ, Gassaway J, Torres A. Severity Assessment in Children Hospitalized with Bronchiolitis Using the Pediatric Component of the Comprehensive Severity Index (CSI®). Pediatric Critical Care Medicine 1:2 (October 2000) 127-132.
- Neumayer LA, Smout RJ, Horn HGS, Horn SD. Early and Sufficient Feeding Reduces Length of Stay and Charges in Surgical Patients. Journal of Surgical Research 95:1 (January 2001) 73-77.
- Antonow JA, Smout RJ, Gassaway J, Horn SD, Willson DF. Variation Among Ten Pediatric Hospitals: Sepsis Evaluations for Infants with Bronchiolitis. Journal of Nursing Care Quality 15:3 (April 2001) 39-49.
- Horn SD. Quality, Clinical Practice Improvement, and the Episode of Care. Managed Care Quarterly 9:3 (Summer 2001) 10-24.
- Horn SD, Sharkey PD, Kelly HW, Uden DL. Newness of Drugs and Use of HMO Services by Asthma Patients. The Annals of Pharmacotherapy 35 (September 2001) 990-996.
- Willson DF, Horn SD, Hendley JO, Smout R, Gassaway J. The Effect of Practice Variation on Resource Utilization in Infants Hospitalized for Viral Lower Respiratory Illness (VLRI). PEDIATRICS 108:4 (October 2001) 851-855
- Horn SD, Wright HL, Couperus JJ, Rhodes RS, Smout RJ, Roberts KA, Linares AP. Association Between Patient Controlled Analgesia Pump Use and Post-Operative Surgical Site Infection in Intestinal Surgery Patients, Surgical Infections (To Appear).

Clinical Practice Improvement

For more information about

Clinical Practice Improvement concepts, see

Clinical Practice Improvement Methodology: Implementation and Evaluation,

edited by Susan D. Horn, Ph.D., 1997,

available by contacting ISIS 801-466-5595, x130

and visit our web site at

www.isisicor.com.